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LUMINARY Memo #200

To: Distribution  
From: V. Dunbar, P. Volante  
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Subject: Implementation and Testing of PCR 324, PGNCS/AGS RR  
Data Transfer

PCR 324 specifies that Rendezvous Radar mark data (range, range-rate, trunnion and shaft angles) be transferred to the AGS via the Rendezvous/Pre-Thrust downlist when P20 is operating. A special code word was added to the downlist to indicate to the AGS when good RR data has been placed on the downlist, and whether the range scale is high or low.

This is accomplished by setting the appropriate code word whenever RR mark data has been successfully read and is being stored into the downlink registers.(The mark data is buffered until a complete set is available, then it is stored in the downlink registers with interrupts inhibited.) The coding to effect this change was put in the LRS22.1 subroutine of R22, which does the radar reads to obtain the mark data. The code word is reset by R65, the Fine Preferred Tracking Attitude Routine. R65 is called by all paths through R22 such that the timing constraints for setting and resetting the code word specified in the PCR are met. (Although this required a further change which is discussed below). It is also reset by Verb 56, by R21 (This is necessary because R21 zeroes the registers containing the trunnion and shaft angles on the downlink) by a Fresh Start, and by a hardware or a software restart.

The settings of the code word are:

- 57776 - Accept data, high range scale
- 17776 - Accept data, low range scale
- 20000 - Do not accept data.

The additional coding changes made in order to implement the PCR were:

- a. A two-second delay was added to R22 in the path where the No Update Flag is set or the Update Flag is reset, in order to meet the requirement that the code word be in the set configuration for at least two seconds.
- b. A check is made so that the AGS code word is not placed in the set configuration within 50 seconds of a previous setting. This is done by subtracting the mark time when the AGS code word was last set from the current mark time. If the difference is greater than 50 seconds, the code word is placed in the set configuration, otherwise it is not.

A series of tests have been defined to demonstrate the proper functioning of the data transfer and to examine the timing of the code word setting/resetting. They are:

1. Nominal case - normal state vector updating cycle.
2. Data good lost during RR read.
3. No Update Flag set, i.e. V95E keyed in to prevent state vector updating.
4. Update Flag not set, i.e. a PRO or V32E response to the V16N45 display to get a solution in a P3X/P7X targetting program.
5. Track Flag not set, i.e. a thrusting program (or any other except targeting) program selected.
6. RR Antenna  $> 30^\circ$  from +Z-axis (This forces a call to R61).

7. Transition from high to low range scale.
  - a. During a read,
  - b. Not during a read.
8. Restarts occurring
  - a. During read,
  - b. After read complete.
9. RR CDU Fail during read.